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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/594,253	09/25/2006	Shinji Inagaki	296761US0PCT	7399
22850 7590 03/02/2011 OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, L.L.P. 1940 DUKE STREET ALEXANDRIA, VA 22314				
EXAMINER BOHATY, ANDREW K				
ART UNIT 1786		PAPER NUMBER		
NOTIFICATION DATE 03/02/2011		DELIVERY MODE ELECTRONIC		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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### Office Action Summary

**Application No.**

10/594,253

**Applicant(s)**

INAGAKI ET AL.

**Examiner**

Andrew K. Bohaty

**Art Unit**

1786

**Period for Reply** -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 14 December 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-5, 10, 11 and 15-20 is/are pending in the application.
- 4a) Of the above claim(s) 15, 19 and 20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5, 10, 11 and 16-18 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-946)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114 was filed in this application after appeal to the Board of Patent Appeals and Interferences, but prior to a decision on the appeal. Since this application is eligible for continued examination under 37 CFR 1.114 and the fee set forth in 37 CFR 1.17(e) has been timely paid, the appeal has been withdrawn pursuant to 37 CFR 1.114 and prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on December 14, 2010 has been entered.
2. This Office action is in response to the amendment filed December 14, 2010, which amends claims 1, 10, and 11 and cancels claims 8, 9, and 12-14. Claims 1-5, 10, 11, and 15-20 are pending, where claims 15, 19, and 20 are withdrawn from consideration.

### ***Response to Amendment***

3. Applicant's arguments and cancellation of the claims, filed December 14, 2010, has caused the withdrawal of the rejection of claims 1-5, 8-14, and 16-18 under 35 U.S.C. 112, second paragraph, as set forth in the Office action mailed April 19, 2010.
4. Applicant's amendment of the claims, filed December 14, 2010, has caused the withdrawal of the rejection of claims 1-5 under 35 U.S.C. 102(b) as being anticipated by Shea et al. (J. Am. Chem. Soc. 1992, 114, 6700-6710) as set forth in the Office action mailed April 19, 2010.

5. Applicant's amendment of the claims, filed December 14, 2010, has caused the withdrawal of the rejection of claims 1-5 under 35 U.S.C. 102(b) as being anticipated by Shea et al. (Chem. Mater. 1989, 1, 572-574) as set forth in the Office action mailed April 19, 2010.
6. Applicant's amendment of the claims, filed December 14, 2010, has caused the withdrawal of the rejection of claims 1-4 and 16 under 35 U.S.C. 102(b) as being anticipated by Fan et al. (US 2003/0039744) as set forth in the Office action mailed April 19, 2010.
7. Applicant's cancellation of the claims, filed December 14, 2010, has caused the withdrawal of the rejection of claims 8 and 9 under 35 U.S.C. 103(a) as being unpatentable over Shea et al. (Chem. Mater. 1989, 1, 572-574) in view of Bartl et al. (Chem. Commun. 2002, 2474-2475) as set forth in the Office action mailed April 19, 2010.
8. Applicant's cancellation of the claims, filed December 14, 2010, has caused the withdrawal of the rejection of claims 12-14 under 35 U.S.C. 103(a) as being unpatentable over Shea et al. (Chem. Mater. 1989, 1, 572-574) in view of Matthews et al. (Chem. Mater. 1993, 5, 1697-1700) as set forth in the Office action mailed April 19, 2010.
9. Applicant's amendment of the claims, filed December 14, 2010, has caused the withdrawal of the rejection of claim 18 under 35 U.S.C. 103(a) as being unpatentable over Shea et al. (Chem. Mater. 1989, 1, 572-574) in view of Mashita et al. (JP 2000-

306669) and Corriu et al. (Chem. Commun. 1996, 1845-1846) as set forth in the Office action mailed April 19, 2010.

### ***Response to Arguments***

10. Applicant's arguments, see page 7, filed December 14, 2010, with respect to the rejection of claims 1-5, 8-14, and 16-18 under 35 U.S.C. 112, second paragraph, have been fully considered and are persuasive. The rejection of claims 1-5, 8-14, and 16-18 under 35 U.S.C. 112, second paragraph, has been withdrawn.

11. Applicant's arguments, for 103 rejections, filed December 14, 2010 have been fully considered but they are not persuasive.

12. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., multi-wavelength emission) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

13. Furthermore, it is well known in the art that the emission wavelength of one luminescent material can cause another luminescent material to emit light, as long as the first luminescent material emits a wavelength that is absorbed by the second luminescent material; therefore, one of ordinary skill in the art would expect multi-wavelength emission to occur if one of the luminescent materials emits a wavelength that is absorbed by the second luminescent material.

14. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

15. In this case the applicant's argue that Bartl fails to suggest that there is any energy transfer between electroluminescent materials can occur such that multi-wavelength emission is realized. The properties the applicant is arguing naturally flows from the combination of Shea 1989 in view of Bartl. Bartl teaches that the light emitted from the mesoporous structure, comprising the rare earth metal compound, is more pure that light emitted from sol-gels that do not have the mesoporous structure (page 2475 left column last paragraph); therefore, one of ordinary skill in the art would be motivated by the teaching of Bartl to modify the sol-gel material of Shea 1989 so the material comprised a rare earth metal compound and a surfactant. This combination would lead to a material that has the properties the applicant argues the Bartl reference does not teach.

### ***Claim Rejections - 35 USC § 103***

16. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

17. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

18. Claims 1-5, 10, and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shea et al. (Chem. Mater. 1989, 1, 572-574) (hereafter "Shea 1989") in view of Bartl et al. (Chem. Commun. 2002, 2474-2475) (hereafter "Bartl").

19. Regarding claims 1-3, 10, and 11, Shea 1989 discloses a siloxane polymer made



from the following monomer, , (573 left column, scheme in the middle of the page, paragraph 1, compounds 3a and 3z) which reads on formula (1) in claim 1, where X is benzene (an applicants' preferred fluorescent molecule that can be excited by light), R<sup>1</sup> is ethoxy (claim 2), n is 3 and m is 2 (claim 3). Shea 1989 discloses that siloxane polymer is porous and the mean pore diameter is 2 nm or smaller (573 right column, paragraph 1). Shea 1989 does teach the use of the siloxane polymers in optics (page 574 left column paragraph 2).

20. Shea 1989 does not teach wherein the porous siloxane polymer comprises another luminescent compound, where that compound is phosphorescent and the compound is "adsorbed on", "bonded to", "filled in" or "mixed with" the polymer, and

wherein the siloxane polymer with the additional luminescent compound further comprises a surfactant.

21. Bartl teaches the encapsulation of rare earth material complexes in sol-gel derived composites (page 2474 left column paragraph 1). Bartl teaches the sol-gel derived composites include mesoporous silica and these materials are used for there optical properties (page 2472 left column paragraph 2). Bartl teaches the rare earth metals compounds to be Eu and Tb containing (page 2474 left column 2 paragraph), which are well known phosphorescent compounds (claims 11 and 14). Bartl teaches that when the phosphorescent rare earth metal complexes are mixed with the siloxane polymer and the polymer made further comprises a surfactant (P123) (claims 9, 10 and 13) (page 2474 left column paragraph 3). Bartl further teaches that the light emitted from the mesoporous structure is more pure that light emitted from sol-gels that do not have the mesoporous structure (page 2475 left column last paragraph).

22. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the siloxane polymer of Shea 1989, so when the polymer was made the synthesis included a surfactant and a rare earth metal compound (phosphorescent material), so the resulting polymer contained an additional phosphorescent compound mixed with the polymer and the polymer further comprised a surfactant. The motivation would have been to make a siloxane polymer structure that emits light with a higher purity. Both Shea 1989 and Bartl teach the use of their sol-gels for use in optics, while Bartl teaches the incorporation of phosphorescent materials in to



the sol-gel network and that mesoporous structure displays better light purity than other mesoporous structures.

23. Regarding claim 4, although Shea 1989 does not specifically disclose wherein the difference in energy between the ground state and any of a singles excited state and a triplet excited is 40 to 140 kcal/mol the siloxane polymer from above inherently has this property. Also, the above siloxane polymer/monomer is an example of the applicants which contain this property (applicant's Ph-Si). Furthermore, the claimed properties would naturally flow from combination of Shea 1989 and Bartl.

24. Regarding claim 5, Shea 1989 discloses the siloxane polymer (page 573 compound 3z) using the above monomer has a structure with a regular spaced array by introduction of the organic spacer (benzene molecule) (page 572, right column paragraph 2, Figure 2). Since the monomer is a benzene ring the period would be less than 5 nm, because benzene has a length smaller that 5 nm.

25. Claims 1-5 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shea et al. (Chem. Mater. 1989, 1, 572-574) (hereafter "Shea 1989") in view of Matthews et al. (Chem. Mater. 1993, 5, 1697-1700) (hereafter "Matthews").

26. Regarding claims 1-3 and 11, Shea 1989 discloses a siloxane polymer made



from the following monomer, , (573 left column, scheme in the middle of the page, paragraph 1, compounds 3a and 3z) which reads on formula

(1) in claim 1, where X is benzene (an applicants' preferred fluorescent molecule that can be excited by light), R<sup>1</sup> is ethoxy (claim 2), n is 3 and m is 2 (claim 3). Shea 1989 discloses that siloxane polymer is porous and the mean pore diameter is 2 nm or smaller (573 right column, paragraph 1). Shea 1989 does teach the use of the siloxane polymers in optics (page 574 left column paragraph 2).

27. Shea 1989 does not teach wherein the porous siloxane polymer comprises another luminescent compound, where that compound is phosphorescent and the compound is "adsorbed on", "bonded to", "filled in" or "mixed with" the polymer, and wherein the siloxane polymer with the additional luminescent compound further comprises a surfactant.

28. Matthews teaches a sol-gel (siloxane polymer) that contains a Eu complex (although not taught by Matthews, Eu complex are known to be phosphorescent) mixed with the polymer (page 1698, right column paragraph 3) (claims 13 and 14). Matthews teaches the doped sol-gel produce red color and have high efficiency and can be used as optical sources (page 1700 entire page).

29. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify to siloxane polymer of Shea 1989 to include the Eu to provide a siloxane polymer with an additional phosphorescent material mixed with the siloxane polymer. The motivation would have been to produce a siloxane polymer that emits red light and can be used as an optical source.

30. Regarding claim 4, although Shea 1989 does not specifically disclose wherein the difference in energy between the ground state and any of a singles excited state

and a triplet excited is 40 to 140 kcal/mol the siloxane polymer from above inherently has this property. Also, the above siloxane polymer/monomer is an example of the applicants which contain this property (applicant's Ph-Si). Furthermore, the claimed properties would naturally flow from combination of Shea 1989 and Matthews.

31. Regarding claim 5, Shea 1989 discloses the siloxane polymer (page 573 compound 3z) using the above monomer has a structure with a regular spaced array by introduction of the organic spacer (benzene molecule) (page 572, right column paragraph 2, Figure 2). Since the monomer is a benzene ring the period would be less than 5 nm, because benzene has a length smaller than 5 nm.

32. Claims 16 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shea et al. (Chem. Mater. 1989, 1, 572-574) (hereafter "Shea 1989") in view of Bartl et al. (Chem. Commun. 2002, 2474-2475) (hereafter "Bartl") as applied to claims 1-5, 10, and 11 above, and further in view of Mashita et al. (JP 2000-306669) (hereafter "Mashita"), where machine translation is used as English equivalent, and Corriu et al. (Chem. Commun. 1996, 1845-1846) (hereafter "Corriu").

33. Regarding claims 16 and 18, Shea 1989 in view of Bartl does not teach wherein the siloxane polymer further comprises an electric charge transporting material. Shea 1989 does not teach a film with a thickness be 1  $\mu$ m or less.

34. Mashita teaches a sol-gel (siloxane polymer) comprising a luminescent material and an electron transporting material (paragraph [0067]). Mashita teaches the use of the sol-gel in electroluminescent devices (paragraph [0011]). Mashita teaches the

thickness of the layer comprising the sol-gel layer is preferably 0.5  $\mu\text{m}$  or less (paragraph [0037]), and shows in the examples the layer can be 110 nm (paragraph [0067]). Mashita teaches the mixed sol-gel proved an electroluminescence device that is very efficient and long lifetime (paragraph [0009]).

35. Corriu teaches the use of bridged siloxane polymers can be used in light emitting diodes (page 1845 left column first three paragraphs).

36. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the siloxane polymer of Shea 1989 in view of Bartl to include an electron transporting material in the polymer and use the material in an electroluminescent device, where the thickness of the film is 0.5  $\mu\text{m}$  or less. Mashita teaches the use of sol-gel in electroluminescent devices, while Corriu teaches that bridged siloxane polymers could be used in light emitting devices and Shea 1989 teaches the use of bridged siloxane polymers comprising of that benzene molecule as the bridging component. The motivation would have been to produce a siloxane polymer that could be used in a light emitting device and be very efficient and have a long lifetime.

37. Claims 16 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shea et al. (Chem. Mater. 1989, 1, 572-574) (hereafter "Shea 1989") in view of Matthews et al. (Chem. Mater. 1993, 5, 1697-1700) (hereafter "Matthews") as applied to claims 1-5 and 11 above, and further in view of Mashita et al. (JP 2000-306669)

(hereafter "Mashita"), where machine translation is used as English equivalent, and Corriu et al. (Chem. Commun. 1996, 1845-1846) (hereafter "Corriu").

38. Regarding claims 16 and 18, Shea 1989 in view of Matthews does not teach wherein the siloxane polymer further comprises an electric charge transporting material. Shea 1989 does not teach a film with a thickness be 1  $\mu\text{m}$  or less.

39. Mashita teaches a sol-gel (siloxane polymer) comprising a luminescent material and an electron transporting material (paragraph [0067]). Mashita teaches the use of the sol-gel in electroluminescent devices (paragraph [0011]). Mashita teaches the thickness of the layer comprising the sol-gel layer is preferably 0.5  $\mu\text{m}$  or less (paragraph [0037]), and shows in the examples the layer can be 110 nm (paragraph [0067]). Mashita teaches the mixed sol-gel proved an electroluminescence device that is very efficient and long lifetime (paragraph [0009]).

40. Corriu teaches the use of bridged siloxane polymers can be used in light emitting diodes (page 1845 left column first three paragraphs).

41. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the siloxane polymer of Shea 1989 in view of Matthews to include an electron transporting material in the polymer and use the material in an electroluminescent device, where the thickness of the film is 0.5  $\mu\text{m}$  or less. Mashita teaches the use of sol-gel in electroluminescent devices, while Corriu teaches that bridged siloxane polymers could be used in light emitting devices and Shea 1989 teaches the use of bridged siloxane polymers comprising of that benzene molecule as the bridging component. The motivation would have been to produce a siloxane

polymer that could be used in a light emitting device and be very efficient and have a long lifetime.

42. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shea et al. (Chem. Mater. 1989, 1, 572-574) (hereafter "Shea 1989") in view of Bartl et al. (Chem. Commun. 2002, 2474-2475) (hereafter "Bartl") as applied to claims 1-5, 10, and 11 above, and further in view of Ogawa (J. Am. Chem. Soc. 1994, 116, 7941-7942) (hereafter "Ogawa").

43. Regarding claims 16 and 18, Shea 1989 in view of Bartl does not teach wherein the siloxane polymer is a layered material of stacked nanosheets, where each layer having a thickness of 10 nm or less. Shea 1989 does teach the use of the siloxane polymers in optics (page 574 left column paragraph 2).

44. Ogawa teaches the synthesis of siloxane polymers that are in a layered structure, where each layer has a thickness of 1 nm (page 7942 left column paragraph 2 Figure 3). Ogawa teaches films are highly transparent in the wavelengths of 220 to 2000 nm (page 7942 right column paragraph 3).

45. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the siloxane polymers of Shea 1989 in view of Bartl, so siloxane polymer was in a stacked structure of nanosheets, where the thickness of each layer was 1 nm. The motivation would have been to form a film that was highly transparent in the wavelengths of 220 to 2000 nm.

46. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shea et al. (Chem. Mater. 1989, 1, 572-574) (hereafter "Shea 1989") in view of Matthews et al. (Chem. Mater. 1993, 5, 1697-1700) (hereafter "Matthews") as applied to claims 1-5, 10, and 11 above, and further in view of Ogawa (J. Am. Chem. Soc. 1994, 116, 7941-7942) (hereafter "Ogawa").

47. Regarding claims 16 and 18, Shea 1989 in view of Matthews does not teach wherein the siloxane polymer is a layered material of stacked nanosheets, where each layer having a thickness of 10 nm or less. Shea 1989 does teach the use of the siloxane polymers in optics (page 574 left column paragraph 2).

48. Ogawa teaches the synthesis of siloxane polymers that are in a layered structure, where each layer has a thickness of 1 nm (page 7942 left column paragraph 2 Figure 3). Ogawa teaches films are highly transparent in the wavelengths of 220 to 2000 nm (page 7942 right column paragraph 3).

49. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the siloxane polymers of Shea 1989 in view of Matthews, so siloxane polymer was in a stacked structure of nanosheets, where the thickness of each layer was 1 nm. The motivation would have been to form a film that was highly transparent in the wavelengths of 220 to 2000 nm.

### ***Conclusion***

50. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew K. Bohaty whose telephone number is

(571)270-1148. The examiner can normally be reached on Monday through Thursday 7:30 am to 5:00 pm EST and every other Friday from 7:30 am to 4 pm EST.

51. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, D. Lawrence Tarazano can be reached on (571)272-1515. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

52. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/A. K. B./  
Andrew K. Bohaty  
Patent Examiner, Art Unit 1786

/D. Lawrence Tarazano/  
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